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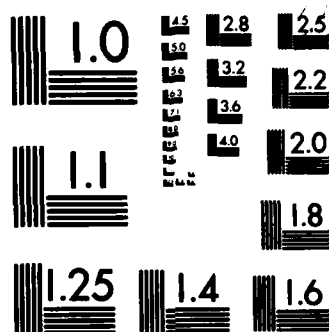
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EXTENDED DEVELOPMENT PROCEDURE

EDeP

USER'S MANUAL

Charles M. Reigeluth
Philip Doughty
Fulya Sari
Charles J. Powell
Linda Frey
Jack Sweeney

Syracuse University

November, 1982

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Disclaimer

The views, opinions, and/or findings contained in this report are those of the authors and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other documentation.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This is a reference Manual (not a training manual) organized to be appropriate for use at the level of knowledge of the user about instructional design. It provides the essential core of design prescriptions for people who do not have much experience or background in design. → <i>all</i> The US Army Training & Doctrine Command commissioned the manual to supplement these aspects of the <u>Interservice Procedures for Instructional Systems Development (IPISD)</u> which deal with the design & developments of instruction.		

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19. Guidance for Learners

20. It is organized in chronological order and takes the form of the steps that are keyed to, and should be integrated into, the steps laid out in the (IPIS) *(Inter-service Procedures for Instructional Systems Development)*.

describes then strategies appropriate skill are
This User's Manual and its companion EDeP Advanced Reference Manual outline and describe such macro level activities as selecting and sequencing, then the major instructional requirements for each skill and knowledge that needs to be taught and the planning of major components or strategies for meeting those requirements. Selection of the most appropriate instructional approach (or combination of approaches) for each skill and knowledge follows. Necessary materials and instructor's manual are then developed in such a way as to utilize the components that are prescribed earlier.

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EXTENDED DEVELOPMENT PROCEDURE
(EDeP)
USER'S MANUAL

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Introduction

Why Use this Manual?

This manual will help you to improve the quality of the instruction you create.

The Interservice Procedures for Instructional Systems Development (IPISD) provided a quantum leap forward in providing guidance to instructional developers and instructors. Nevertheless, developers and instructors have often complained that the smallest volume in the set is the one on the design phase. This has been a source of some frustration because it is in the selection of instructional strategies that they feel the strongest need for guidance. In fact, our knowledge base about what makes instruction effective and appealing has grown considerably since the IPISD was written. In recognition of this situation, TRADOC commissioned this manual to supplement those aspects of the IPISD which deal with the design of instruction.

This User's Manual (UM) and its Advanced Reference Manual (ARM) companion present an Extended Development Procedure (EDeP) for developers of military training programs and materials. The EDeP expands on block II.4 and parts of blocks III.1-III.4 of the IPISD. Both manuals are intended to provide a set of prescriptive procedures which clarify and extend the general specifications included in those blocks of the IPISD.

Who Should Use this Manual?

Primary users of these two manuals are intended to be TRADOC training developers, including senior NCO's, Warrant Officers, Officers and professional civilians. In addition, professional civilians from Army Training Centers are also included, since much of their training and training development work is focused upon the teaching of basic skills, which typically require careful and powerful instructional design.

How Should this Manual Be Used?

This is not a training manual! It is a reference manual.

Unless you have considerable experience designing instruction, you must participate in an EDeP workshop before you try to use this manual.

This reference manual is organized in a unique way. It is organized to be appropriate for your level of knowledge about instructional design. The User's Manual (UM) provides the essential core of design prescriptions. Only those prescriptions that provide the most mileage are included, making it fairly manageable for people who do not have much experience or background in design.

On the other hand, for those who do have a lot of experience and background in instructional design, the Advanced Reference Manual (ARM) provides prescriptions for dealing with a much wider variety of kinds of instruction and for dealing effectively with more complex and difficult tasks.

So this reference manual is designed to grow with you. But just as you would not put on a pair of shoes five sizes too large for you, you should not use the ARM before you are ready! Please heed the following:

- Do not use the ARM until you have at least 8 weeks of experience using the UM. (The more prior experience and background you have in instructional design, the more you can cut off of that figure, but in all cases we recommend a minimum of 2 weeks using the UM before you attempt to use the ARM.
- When you are ready to move on to the ARM, do not try to tackle it all at once! Try mastering one chapter at a time, consolidating your knowledge of one chapter before attempting to take on another one. In this way, the manual will grow with you. You will trip and fall if your shoes are too big! If you don't consolidate your skills before expanding them, you will lose what you once had.
- Whenever the situation will call for using the ARM, the UM will direct you to the appropriate part of it. If you are not ready for that part of the ARM yet, you should either (1) swap tasks with a designer who is working on your development team and has already moved on to that part of the ARM or (2) put that task aside for a while and work on another task that does not require the use of the ARM.

One final comment about using this manual: Don't let these nice, neat, mechanical procedures prevent you from using your own creativity and intuition. There are still a lot of things we don't know about what makes good instruction. We do offer you a lot of good guidance, but your best bet is to combine these prescriptions with your own creativity and that of other members of your team -- especially experienced instructors.

Form of Steps

Since it is a reference manual, EDeP's prescriptions are organized in chronological order -- the order in which they should be used. Hence, EDeP takes the form of steps that should be integrated into the steps laid out in the IPISD.

EDeP is made up of 14 major steps (see the foldout flowchart on the back cover of this manual). Each of those steps is broken down into (1) sequential substeps that provide more detailed guidance for accomplishing the major step and (2) a list of nonsequential guidelines that provide an equally important but very different form of guidance for accomplishing the major step. The guidelines are more like principles of instruction which need to be taken into consideration as you perform the step but which cannot be arranged sequentially in step format.

Identifying and Meeting Instructional Requirements

For learning to occur, an instructional designer must identify what obstacles or difficulties are likely to exist for the learners and hence what the requirements for the instruction are. Although there are many different ways that such requirements can be classified, we have found the following kinds of requirements to be very useful for designing instruction.

Performance requirements indicate the nature of the performance that must be learned. The most important performance requirements are (1) remembering things that have been taught and (2) generalizing to cases that have not been encountered during instruction. However, it is also important to distinguish between two levels of remembering: (1a) remembering something verbatim, which is usually rote learning, and (1b) remembering something on a paraphrase level, which requires meaningful integration with prior knowledge. These distinctions are important because the characteristics (or strategies) that the instruction must have in order to be effective (such as examples and analogies) will be different depending upon these instructional requirements.

Content requirements indicate the nature of the content that must be learned. How does one design a good example or a good rule? What kinds of content information should be included (such as the presence of all critical attributes and the name or label for an example of a concept)? The design process is much quicker, easier, and more reliable when you have knowledge about how to identify and meet such instructional requirements.

Richness requirements indicate how difficult the desired learning is likely to be, given the ability and background of the learners. As Benjamin Bloom has said, almost all learners can be taught almost anything given enough time and help. How much help should you build into the instruction (such as memory devices, visuals, large numbers of examples and practice, attention focusing devices, analogies, and so forth)? How much remediation should you design? Again, knowledge about how to identify and meet such instructional requirements is essential to effective and efficient instructional design.

Motivational requirements indicate what kinds of motivational problems need to be addressed in the design of the instruction (such as the need to gain the learner's attention, the need to demonstrate relevance, the need to build the learner's confidence in his or her ability to learn the task at hand, and so forth). They also indicate the magnitude of each of those problems and hence the amount of attention that they need to receive in the design of the instruction. Motivation is half the battle in designing effective instruction -- and it is too often overlooked with disastrous effects.

Many other kinds of requirements can be and have been identified. The important point here is that EDeP is designed to help you to systematically identify such instructional requirements and to select instructional strategies to meet those requirements. You will find it helpful to keep this in mind each time you use the manual.

Summary of the EDeP Procedure

As you employ the procedures in the UM and ARM, you will first perform such macro level activities as selecting and sequencing the skills and knowledges that are required to perform the task. Then you will identify the major instructional requirements for each skill and knowledge that needs to be taught, and you will plan the major components or strategies for meeting those requirements. Next you will select the most appropriate instructional approach (or combination of approaches) for each skill and knowledge. The alternative approaches include individualized resources, tutoring, lecture, discussion, group activities, and projects. Once the most appropriate approach (or combination of approaches) has been selected for each skill and knowledge, you will identify additional components or strategies that are appropriate for that particular approach. Then all necessary materials and instructor's manuals are developed in such a way as to utilize the components that were prescribed earlier for meeting the instructional requirements.

Research Support

EDeP was developed from a fairly extensive review of the research literature. The review itself is reported in a separate document available from TRADOC.

UNIT 1 THE BASIC EDeP

Overview

EDeP Steps

1. Sequence the units.
For each unit:
 2. Identify and classify unit content.
Next unit.
- For each unit:
 3. Design a simple-to-complex sequence of blocks.
Next unit.
- For each unit:
 - For each block:
 4. Sequence the content within each block.
Next block.
 - Next unit.
- For each unit:
 - For each block:
 - For each skill or knowledge:
 5. Plan which basic components to include.
 6. Plan the nature of each basic component. <--- II.2 Develop tests (partial).
 7. Plan the enrichment components.
 8. Select a presentation approach(es).
Next skill or knowledge.
 9. Review and revise approaches.
 10. Review/select and revise existing materials. ---> III.3 Review/select existing units.
 11. Create resources and guidance: <-- III.4 Develop instruction.
 - Individualized resources <--- II.2 Develop tests (rest).
 - Group activities ---> III.2 Specify instruction management plan & delivery system.
 - Lecture
 - Tutoring
 - Discussion
 - Projects.
 12. Develop block summarizers and synthesizers.
Next block.
 - Evaluate and revise ---> III.5 Validate Instruction.
 - Next unit.

IPISD Blocks

- I.1 Analyze job.
- I.2 Select tasks/functions.
- I.3 Construct job performance measures.
- I.4 Analyze existing units.
- I.5 Select instructional setting.
- II.1 Develop objectives.
- II.2 Develop tests (end-of-unit test(s) only).
- II.3 Describe entry behavior.
- <--- II.4 Determine sequence and structure.

<--- III.1 Specify learning events/activities.

---> III.3 Review/select existing units.

<-- III.4 Develop instruction.

<--- II.2 Develop tests (rest).

---> III.2 Specify instruction management plan & delivery system.

---> III.5 Validate Instruction.

IV.1 - V.3 (Rest of IPISD).

(See back cover or folder flowchart.)

WHEN TO USE EDeP

If you are developing a new unit or units, do NOT begin with EDeP!

1. Begin with the IPISD.
2. After you have finished with Blocks I.1 (Analyze job) - II.3 (Describe entry behavior) of the IPISD, start using EDeP. (Note: When you do Block II.2, Develop Tests, you only need develop the end-of-unit test(s). The interim, or block, tests will be developed as a part of EDeP.)
3. During EDeP, activities in Blocks III.2 (Specify management plan and delivery system) and III.3 (Review/select existing materials) of the IPISD will be referenced before you are directed back into Block III.5 (Validate instruction) to complete the development process with the IPISD.

If you are improving your own existing unit, it is probably unnecessary to do any of the analysis activities prescribed by the IPISD (Analyze job, Select tasks/functions, Construct job performance measures, Analyze existing units, and Select instructional setting. It is probably also unnecessary to do much of Block III: Develop objectives and describe entry behavior; and at this point you need not worry about developing (revising) the unit test -- that will be easier to do after having developed the block tests as a part of EDeP. Therefore, ...

1. You may find it most helpful to start directly with EDeP.
2. During EDeP, activities in Blocks III.2 (Specify management plan and delivery system) and III.3 (Review/select existing materials) of the IPISD will be referenced before you are directed back into Block III.5 (Validate instruction) to complete the development process with the IPISD.

CHAPTER 1
STRUCTURE AND SEQUENCE THE INSTRUCTION

Overview

1. Sequence the units.
For each unit:
 2. Identify and classify unit content
Next unit.
- For each unit:
 3. Sequence the blocks.
Next unit.
- For each unit:
 - For each block:
 4. Sequence the content within each block.
Next block.
- Next unit.

STEP 1 SEQUENCE THE UNITS

If you are designing a curriculum, decide on the nature and scope of each unit (i.e., course) in that curriculum, decide on a sequence for those units, and write down the major goals for each unit.

If you are just designing a single unit, skip to Step 2.

Purpose

In designing a curriculum the most important considerations are deciding what to teach in each unit and what order in which to teach those units. Once the content for each unit is decided upon, then the sequencing must be based on the major curriculum goals, in combination with sound learning principles.

Inputs

- a. Needs analysis.
- b. Experienced Instructor (EI).
- c. Subject Matter Expert (SME).

Substeps

1.1 Based on the needs analysis and with the help of a Subject Matter Expert (SME) and an Experienced Instructor (EI), write the major curriculum goals, and identify the scope (major limits or boundaries) for each.

- These goals should be at a very general level.
- The goals should state what the learner will be able to do, if possible, at this general level of description.
- Scope (limits or boundaries) is usually best indicated by listing the types of cases that the soldier is expected to be able to handle after the unit. For example, for addition one might list 1-digit numbers for a first-grade unit, 2-digit numbers with no carrying for a second-grade unit, and 3-digit numbers with carrying for a third-grade unit. Criterion level and standards can also be listed.
- The number of curriculum goals will vary depending on the size of the curriculum. It need only come to an average of about 5-10 per unit.

1.2 For each curriculum goal, decide (with the help of the SME and EI) whether or not accomplishing the goal requires the soldier to use primarily rules or principles.

- A rule is a sequence of steps which are followed to achieve a goal.
- A principle is usually a statement of causes or effects. It shows how a change in something is related to a change in something else. It is underlying knowledge that the soldier can use to generate the right rule for the right situation, which is very important when there is a lot of variation as to the best rule to be used from one situation to another.

1.3 With the help of the EI (or SME), identify all goals which are related to another goal, in that (a) rules of one have many steps or processes that are basically the same as the other goal's rules, or (b) principles of both goals can be viewed as elaborations of a single more general principle.

- Often many rules, like subtraction and division, are related in that one of the rules (or parts of it) is a part of the other.
- Often many rules, like subtraction and addition, are related in that both can be considered branches of a single, more inclusive rule, like solving arithmetic problems. In such a case, the two rules are combined by adding a decision step to the beginning.

- Often many principles, like the effects of the density of an optical medium on the velocity of light and the relationship between the angle of incidence and the angle of refraction, can be viewed as elaborations on a single more general principle, like the effects of the curvature of a lens on the focal length of the lens, because they explain why the more general principle is true, or they explain more about the causes or the effects than does the more general principle.

1.4 a. For all rule-oriented goals that are related, imagine a simple-to-complex sequence of goals based on the combined rules; and, if necessary, rewrite the goals and their scope so that the units can be arranged in a rule-based simple-to-complex sequence.

- At this point, it is not necessary to have a list or even a clear idea of the rules themselves and their sequence.

b. For all principle-oriented goals that are related, imagine a simple-to-complex sequence of units based on those principles; and, if necessary, rewrite the goals and their scope so that the units can be arranged in a principle-based simple-to-complex sequence.

- At this point, it is not necessary to have a list or even a clear idea of the principles themselves and their sequence.

c. For all goals that are unrelated to any other goals (with respect to either rules or principles), try to think of any other reasons why one should be taught before another. Perhaps many of the concepts that are introduced for one goal are required for another goal (a learning prerequisite relationship among the goals). Perhaps one is easier and more familiar than another, and teaching the more familiar goal first will make the other goal more familiar to learners than it would otherwise have been.

- Keep in mind Bruner's notion of a "spiral curriculum", in which the early units teach simplified versions of diverse skills and later units cycle back to teach those same skills at a more sophisticated level.
- To pick the goals for the first unit, it is helpful to ask the EI (Experienced Instructor) which goals he or she would teach in the unit if he or she could only have the learners for that one unit. This way, the most fundamental goals for the curriculum will be taught first, and all other goals will be presented as elaborations of the more fundamental goals.

1.5 Based on 1.4 and input from the EI:

- Decide on the nature and scope of each unit in the curriculum.
- Decide on a sequence for those units.
- Write down the major goals for each unit in terms of the appropriate kind of content (rules or principles), and make sure to identify the scope (limits or boundaries) of each unit goal.
 - The scope usually indicates the degree of sophistication or complexity for the types of cases related to the goal. It can also indicate the criterion level and/or the standards.

Outputs

- A list of curriculum goals.
- A list of unit goals for each unit in the curriculum.
- An indication of the sequence in which the units will be taught.

STEP 2 IDENTIFY AND CLASSIFY UNIT CONTENT

For each unit (i.e., course) decide what content it should teach, and decide whether its simple-to-complex sequence should be based on rules or principles.

If principles, then use the ARM's Advanced Reference Manual's) version of Step 3. (If you have not yet had a workshop on the use of the ARM, then arrange for a designer who has to design the sequence for this unit.)

If rules, then use this manual's version of Step 3.

Purpose

This step continues the process of deciding what to teach in each unit, but it also begins to address the question of how to sequence the content within each unit. This concern can have a major impact on how meaningfully the content (or task) will be learned and how motivational the instruction will be.

Inputs

- a. The list of unit goals for each unit in the curriculum (from Step 1).
- b. The task analysis for all tasks that are critical to achieving the unit goals. Preferably the tasks will have been analyzed with TRADOC's ETAP (Extended Task Analysis Procedure) as a part of Phase I.2 of the IPISD process.
 - ETAP combines the information-processing approach with the hierarchical approach to task analysis, plus it permits the analysis of "soft skills" or "transfer tasks" by identifying principles (underlying knowledge) for soldiers to use to generate the appropriate rule for each different situation. In essence, ETAP provides more of the necessary inputs for using EDeP, but the lack of an ETAP analysis should not discourage you from using EDeP.
- c. An Experienced Instructor (EI).
- d. A Subject Matter Expert (SME) if possible.

Substeps

- 2.1 If you are designing more than one unit, pick the first (or next) one.
- 2.2 Based on the unit goals, inspect the results of the task analysis to identify, with help from the EI (and SME if possible), all skills and knowledges that should be taught in this unit.
- 2.3 Decide if the content identified in 2.2 is primarily rules or primarily principles.
 - If the majority are principles, then go to Step 3 in the Advanced Reference Manual to design a sequence for this unit.*
 - If the majority are rules, then continue with this step.
- 2.4 Decide if any of the rules have considerable overlap with any other rules identified in 2.2. If not, skip to Step 3.
 - By "considerable overlap", we are referring to such cases as a rule for changing a tire on a jeep, a rule for changing a tire on a truck, etc. These can all be taught as cases of a single rule, where there is some variation in the steps of the rule in each case. Once the major rule is learned (including examples of the variations), then the learner will be able to generalize to new variations with a minimum of difficulty. This major rule is often referred to as a "higher-order" rule.

2.5 For any rules that have much in common with other rules, help the EI (or SME) identify a higher-order rule to be taught in place of all the common rules, with the variations being presented as examples rather than as distinct generalities.

2.6 If you are designing more than one unit, repeat Step 2 for each remaining unit.

* Note: If you have not been using this UM for at least 8 weeks, do not use the ARM yourself. You must consolidate your knowledge on the UM first. Give this unit to a more advanced designer to use the ARM.

Outputs

- a. A list of all skills and knowledges that should be taught in each unit.
- b. A decision as to the type of content (rules or principles) that will provide the basis for the simple-to-complex sequencing of blocks within each unit.
- c. If rules were picked for output b, a decision as to whether or not any rules should be replaced by a higher-order rule, and a description of any such higher-order rule.

STEP 3 DESIGN A SIMPLE-TO-COMPLEX SEQUENCE OF BLOCKS BASED ON RULES

If the content is primarily rules, do this step. Otherwise, go to the Advanced Reference Manual (ARM) to do the alternate version of this step. Decide which rules will be taught in each block of each unit, and design a simple-to-complex sequence for those blocks.

Purpose

Instruction should start by making the learner competent in the most basic, fundamental, simple versions of the tasks that are to be taught. In this way, learners have an early opportunity to do complete performances of the simplest cases of a task, which improves motivation and provides a more holistic understanding of the task and its purpose and function (i.e., the relationship between its inputs and its goal).

Inputs

- a. All the outputs from Step 2.
- b. Subject Matter Expert (SME) or Experienced Instructor (EI).

Substeps

3.1 Have the SME (or EI) decide what rules he or she would teach if he or she only had the soldiers for a total of 8-16 hours of instruction before they had to go to the "field" to do the task unaided. Designate these rules for Block 1 of the unit.

- In deciding which (and how many) rules can be taught in the 8-16 hours, keep in mind that you should end up with very few rules in this block. This is because whatever rules are selected will be taught on the application level -- teaching the soldier how to do things. Much instructional time will be used on examples and practice. This block should not teach many rules on the remember-level -- merely listing or summarizing the things that the soldier needs to do. This precaution can be relaxed a bit if the soldier already knows "how to" and only needs to learn "what to". Trying to teach too much in too little time will have disastrous effects on the quality of the instruction.
- The selection of 8-16 hours as a block of instruction is based on research which suggests that approximately 10 hours is the smallest block of instruction to show observable effects of sequencing. Shorter blocks can usually be reorganized by the human mind, thereby wiping out any effects of sequence for those shorter blocks.

3.2 Help the SME (or EI) to decide what additional rules (or additional parts of a rule) would be taught if he or she only had the soldier for an additional 8-16 hours of instruction. Designate these for Block 2 of the unit.

3.3 Continue this process until you have allocated all of the rules to blocks.

3.4 Make sure that the unit is of appropriate length. If necessary, make arrangements to increase the allotted time, or move content from the end of this unit to the beginning of the next unit.

3.5 If you are designing more than one unit, repeat Step 3 for each remaining unit.

Outputs

- a. A list of rules for each block of each unit in the curriculum.
- b. The sequence in which the blocks of each unit will be taught.

STEP 4 SEQUENCE THE CONTENT WITHIN EACH BLOCK

If the content is primarily rules, do this version of this step. Otherwise, go to the ARM to do the alternate version of this step. For each block, identify the steps that should be taught, plan to start with a demonstration of the whole task, sequence the steps, identify any principles that should be taught and nest them within the sequence, and identify any prerequisite concepts or facts and nest them with the sequence.

Purpose

This step is extremely important. If the appropriate steps are not identified, then you will not be teaching what the learners need to know. A good demonstration illustrates the objective in a concrete and motivational way that is usually superior to any verbal statement of the objective for the block. Including relevant principles in the instruction can make the rules more meaningful and can result in better transfer to new situations. And failure to identify and include prerequisite concepts and facts is likely to result in instruction that fails no matter how well the rest of it is designed.

Inputs

- a. The list of rules for each block.
- b. The task description from the task analysis.

Substeps

- 4.1 Pick one block for one unit, and, based on the list of rules for that block, identify all steps (from the task analysis) that should be taught in that block.
 - Make sure that those steps have been analyzed down to the entry level of knowledge for this block. This means that the verbs that are used are understandable and precise. For example, "fix the carburetor" is not precise. What actions does one do in order to fix the carburetor? The steps that you identify should have precise verbs (in relation to learner entry knowledge), such as "remove the two screws in the back of the carburetor".
- 4.2 If possible, plan to start the instruction with a real-world demonstration that is representative of the block activities, but does not demonstrate the entire activity.
 - A demo of the entire activity would probably be overwhelming for the learner. The demo does not serve to impart any skills, rather it serves to give an overview or schema which provides a meaningful context to which the following instruction can be related.
 - The demo should be highly representative of the whole task. It should have a fairly standard beginning and ending, but its "middle" should usually leave out the more complicated branches that are sometimes used in the task. A relatively simple yet common and highly representative "path" through the rule is ideal if it exists.
 - The demo should not involve highly mobile events, highly changeable circumstances, or highly dangerous tasks.
- 4.3 Arrange the steps identified in 4.1 in a forward-chaining sequence, with the following exceptions:
 - If the real world environment for the block task(s) is not the same as the classroom environment, then arrange for content that can be taught in the cheapest, most abstracted environment to be taught first, fol-

lowed by content for progressively more expensive and more realistic environments. For this instructional sequence to be effective, though, a general overview (in the form of a demonstration) of a simple version of the whole task should first be presented to the learner (see Substep 4.2 above). Only after seeing the overall picture can the extracted knowledges and skills be learned most efficiently and with high motivation.

- If different steps need to be taught in different locations and it is expensive or time consuming to switch locations, or difficult to schedule locations, then group steps according to the location in which they should be taught.

4.4 If there are any major principles that should be taught in this block, decide when they should be taught in relation to the rules that have already been sequenced.

- Major principles are ones that underly or relate to the whole rule or set of rules in the block.

4.5 If there are any supporting principles that should be taught in support of individual rules or steps, sequence them immediately after (or immediately before) their related rules or steps.

- Supporting principles are ones that underly or relate to a small rule or a part of a bigger rule.

4.6 With the help of the EI, inspect the task description (from the task analysis) for any prerequisite concepts or facts which may exist for any of this block's skills or knowledges. If any of those prerequisites have not been mastered by this point in the unit, then plan for each to be taught immediately before the step or principle for which it is prerequisite, with the following exception:

- If any such concepts are highly interrelated (e.g., with parts or kinds super/co/subordinate relationships), then group them. In other words, if any concept is either a kind or a part of another concept (e.g., verb is a kind of word), then those two concepts should be taught back-to-back. Also, if any two concepts are either kinds or parts of another (single) concept (e.g., verb and noun are both kinds of a single concept, word), then those two concepts should be taught simultaneously.
- Note that prerequisite skills (rules) are not included in this substep. Those who are familiar with ETAP (Extended Task Analysis Procedure) know that all prerequisite rules have already been identified and incorporated into the rules that have been selected for this block. The guideline for Substep 4.1 advises that this be done by making sure that all steps have been analyzed down to the entry level of knowledge for this block. It is essential to identify those procedural prerequisites (rules) earlier so that the proper amount of procedural content can be selected in Substep 3.1 above.

4.7 Repeat Step 4 for each block of each unit.

Outputs

- A list of all steps that will be taught in each block of each unit.
- An indication of the sequence in which those steps will be presented within each block of each unit.
- An indication of when each relevant principle will be presented within each block of each unit.
- An indication of when each prerequisite concept and fact will be presented within each block of each unit.

CHAPTER 2

DESIGN THE INSTRUCTIONAL COMPONENTS

Overview

For each unit:

For each block:

For each skill or knowledge:

5. Plan which basic components to include.
6. Plan the nature of each basic component.
7. Plan the enrichment components.
8. Select a presentation approach(es).

Next skill or knowledge.

9. Review and revise approaches.

STEP 5

PLAN WHICH BASIC COMPONENTS TO INCLUDE IN THE INSTRUCTION

Based on the performance requirements of the instruction, pick the optimal model of instruction (which is an integrated set of components) for the desired learning level and the given conditions, and thereby prescribe the essential strategy components to be included in the instruction.

Purpose

The purpose of this design step is to plan the most basic aspects of the instruction which should be used regardless of the approach (e.g., individualized resources, tutoring, lecture). This activity will probably have a greater influence on the quality of the instruction than any other single design activity.

Inputs

- a. Performance requirements (from the task analysis).
- b. Subject Matter Expert (SME).

Substeps

5.1 Pick a single skill or knowledge within a block.

- Make sure that it is "bite-sized". This means that it should be neither too large for the learner to keep it all in his or her mind at the same time, nor so small that it divides the learning process into an unnecessary number of fragments. For remember-level tasks, you should follow Miller's magic number of 7 plus or minus two items. For application-level tasks, make it a single concept or principle; or if it is a rule, make it a single step if the steps are fairly difficult, or several steps if they are fairly easy.

5.2 With the help of a Subject Matter Expert (SME), decide whether the desired level of performance requires the learner to memorize something (such as fact learning) or to generalize to new cases (such as concept classification and rule using).

- If memorization, then plan to use the remember model for this skill or knowledge (see Substep 5.3).
- If generalization, then plan to use the application model (see Substep 5.4).
- If behavioral objectives were prepared in Step II.1 of the IPISD process, then pay attention to the verb. Verbs and verb phrases that appear in the objective are the key to identifying the proper performance level. Verbs such as recall, remember, identify, describe, point, select, choose, restate, paraphrase, and state verbatim usually indicate that the remember level is most appropriate (but not always). Verbs such as apply, solve, transfer, classify, and synthesize usually indicate that the application level is most appropriate. But double-check it with the SME!
- If behavioral objectives are not available, elicit the SME's opinion on the skill or knowledge as described by the task analysis. If rote memorization is enough for satisfactory task performance on the job -- that is, if no transfer to new situations is required -- then it should be taught at the remember level. Otherwise the application level is more appropriate.

5.3 If you selected the remember model, then plan to include the following strategy components in the instruction. (At this point, you should not actually write any of these components -- just prepare a "blueprint" that indicates your plans to use them.)

- A presentation of all of the information that is to be memorized (either a fact, instance, or generality).
 - The presentation should include two elements, often referred to as the stimulus and the response. In effect, learning the information entails associating one of these two elements with the other, such that when one is presented to the soldier, the other will be remembered by the soldier.
 - If there is a lot of information to be memorized, then plan to break it into pieces and teach each of those pieces separately, using all of these strategy components for one piece before using any strategy components for the next piece. (Integration should occur after each piece has been memorized -- see "Synthesis" below for details.)
- Practice with positive feedback.
 - Practice entails presenting a part of the information (e.g., "the capitol of the U.S.") and requesting the learner to provide the rest (e.g., "Washington, D.C.").
 - By "positive feedback", we mean that the following should be done. If the learner gets it right, then give praise. If the learner gets it wrong, then do not criticize or degrade the learner -- just provide the right answer.
- Repetition, both for the information and for the practice.

For more guidance in planning these components, see Step 6, which provides guidance based on the content requirements of the instruction.

5.4 If you selected the application model, then plan to include the following strategy components in the instruction. (At this point, you should not actually write any of these components -- just prepare a "blueprint" that indicates your plans to use them.)

- The generality -- a general statement of the skill or knowledge.
 - It could be the definition of a concept or the statement of a rule or principle.
- Examples that are as different as possible from each other.
 - These examples should represent as accurately as possible the kinds and variety of cases or situations to which the generality will need to be applied in performing the real task.
 - Plan to present the easier ones first.
 - Keep in mind that your examples must show all that needs to be illustrated: all of the common characteristics if the skill or knowledge is a concept, all of the steps if it is a rule, and all of the relevant causes and effects if it is a principle.
- Practice with positive feedback.
 - As with the examples, the practice items should represent as accurately as possible the kinds and variety of cases or situations to which the generality will need to be applied in performing the real task.
 - Again, plan to present the easier ones first.
 - By "positive feedback", we mean that the following should be done. If the learner gets it right, then give praise. If the learner gets it wrong, then do not criticize or degrade the learner -- just provide the right answer and a clear explanation

as to why it is right or how it was derived.

For guidance in planning the nature of each of these components, see Step 6, which provides guidance based on the content requirements of the instruction.

Outputs

- a. The selection of an instructional model (either remember or application) for this single skill or knowledge.
- b. A "blueprint" as to what basic components will make up the instruction.

Example

Combat communications FM 24-1 represents unit materials which "set forth the basic concepts of U.S. Army tactical communications-electronics doctrine in a practical format. It is aimed at all personnel from the firstline supervisor to the highest echelon of command. This manual, along with the other 'How to Fight' manuals, presents principles for winning the land battle, accomplishing the Army's primary mission."

As is clear from the above excerpt the expected learning outcomes for this unit should be at the application level. The learners will be able to understand and apply those concepts and principles in any new situation they will encounter, especially in warfare. Merely memorizing those concepts and principles will not help them accomplish their mission; learners must be able to apply them in new (previously unencountered) situations. Therefore the application model should be used for each of these concepts and principles.

STEP 6 PLAN THE NATURE OF EACH BASIC COMPONENT

If the skill or knowledge is to be learned at the application level, then outline the critical information that the generality should contain. Also plan the general nature of the examples and practice in such a way (a) that they contain the same critical information and (b) that they are as consistent as possible with the real-world performances of the task. Decide on the variations and number of examples and practice items.

If the knowledge is to be learned at the remember level, then plan the general nature of the presentation and the practice, including the representations that should be used.

Purpose

The approaches (e.g., individualized resources, lecture, tutoring) and the media of instruction need to be selected before the examples and practice can be fully planned and developed. But the selection of the most appropriate approaches and media are only possible after thinking about the characteristics of the stimuli and responses that need to be illustrated and practiced. Also, later decisions will be facilitated by deciding now how many examples and practice are needed to provide the desired level of richness for the instruction.

Inputs

- a. Desired performance level (remember or apply).
- b. Subject Matter Expert (SME) or knowledge of real-world conditions of performance.
- c. Experienced Instructor (EI) or both knowledge of the task and experience in teaching the task to the target learners.

Substeps

If remember model, do Substeps 6.1 - 6.2. If application model, do Substeps 6.3 - 6.6.

For the Remember Model

6.1 Help the SME to decide whether the information needs to be memorized verbatim or whether a more meaningful, paraphrased type of remembering is more appropriate for on-the-job performance. If verbatim, then plan not to include any alternative representations of the information. If meaningful learning is desired (paraphrase level), then help the SME OR EI to identify all the forms in which the stimulus may be represented on the job, and all forms in which the response may need to be represented on the job. Plan for the presentations to include the full variety of representations for the real-world task.

- There may well be only one form in which the stimulus and response are represented on the job. It may also be that the response needs to be remembered verbatim, as opposed to paraphrased.
- On the other hand, the variety of representations for the real-world task may include: objects or actions, visual representations (pictures, diagrams, etc.), audio representations (sounds, voices, etc.), or symbolic representations (written words, numbers, etc.).

- If objects are involved in the memory task, then it is usually important to present those objects (concrete representations) to the learner to see and manipulate.

6.2 Help the EI to outline the way in which the information will be presented, practiced, and tested with each form of representation. This outline should indicate all of the critical information that the presentation should contain. Keep in mind the plans from Step 5.

- The purpose of this Substep is to determine any characteristics of the performance (stimuli or responses) that may influence the selection of the approach(es) for the instruction (individualized resources, lecture, group activities, tutoring, etc.) and/or the media to be used in the approach(es).
- To plan the presentations and practice, think in terms of what stimuli need to be presented to the learner and what actions need to be performed by the learner. Consistency with the real-world task is a very important consideration.
- Be sure to plan any need for objects, visuals, or sound and any need for interaction capabilities, and consider the requirements relating to setting, time, and people. Again, consistency with the real-world task is a very important consideration.
- As has just been indicated, for effective instruction, the nature of the practice should be consistent with the nature of the real-world performance of the task. However, if the task is a very difficult one, you should plan ways to simplify the early practice.
- Another important consideration for planning the practice is the need to provide good, immediate feedback to the learner without the learner being able to "peek" at the answer.
- At this point, think in terms of the ideal; ignore any resource or logistical constraints. They will be taken into consideration later.

Go to the ARM (Step 6 Supplement) for more detailed guidance on planning ways to meet the content requirements for the stimulus and response.

However, do not use the ARM unless you have had sufficient practice in working with the UM.

For the Application Model

6.3 Outline the generality. This outline should indicate all of the critical information that should be contained in the generality, the examples, and the practice. Keep in mind the plans from Step 5.

- Make note of any alternative representations (such as visuals, audio, etc.) that may be required by the nature of the desired performance.
- For more detailed guidance on planning ways to meet the content requirements for the generality, refer to Step 6.10 in the ARM. However, do not use the ARM unless you have had sufficient practice in working with the UM.

6.4 Plan the general nature of the practice. Keep in mind the plans from Step 5.

- The purpose of this Substep is to determine any characteristics of the performance (stimuli or responses) that may influence the selection of the approach(es) for the instruction (individualized resources, lecture, group activities, tutoring, etc.) and/or the media to be used in the approach(es).
- To plan the practice, think in terms of what stimuli need to be presented to the learner and what actions need to be performed by the learner. Consistency with the real-world task is a very important consideration.

- Be sure to plan any need for objects, visuals, or sound and any need for interaction capabilities, and consider the requirements relating to setting, time, and people. Again, consistency with the real-world task is a very important consideration.
- As has just been indicated, for effective instruction, the nature of the practice should be consistent with the nature of the real-world performance of the task. However, if the task is a very difficult one, you should plan ways to simplify the early practice.
- Another important consideration for planning the practice is the need to provide good, immediate feedback to the learner without the learner being able to "peek" at the answer.
- At this point, think in terms of the ideal; ignore any resource or logistical constraints. They will be taken into consideration later.
- For more detailed guidance on planning ways to meet the content requirements for the practice, refer to Step 6.12 in the ARM. However, do not use the ARM unless you have had sufficient practice in working with the UM.

6.5 Plan the general nature of the examples. Keep in mind the plans from Step 5.

- The guidelines are the same as for 6.4 above, except that "demonstration" should be substituted for "performance".
- An additional consideration for planning the examples is being able to point out important aspects of the demonstrations.
- For more detailed guidance on planning ways to meet the content requirements for the examples, refer to Step 6.11 in the ARM. However, do not use the ARM unless you have had sufficient practice in working with the UM.

6.6 Help the EI to identify the ways that performances can vary in the real world and hence should vary in the examples and practice.

- If there is a lot of variability, you may want to devise a coding system for classifying the different variations. This will be helpful to maintain balance when you assign the instances to examples, practice, and test.
- In the case of concepts, this will be variable attributes -- characteristics that vary among the instances of the concept.
- In the case of rules, it will be differences in inputs, outputs, and steps used.
- In the case of principles, it will be differences in context and differences in instances of the concepts that are involved in the principle.
- These variations are prescribed to meet the content requirements of the instruction. Step 7 prescribes other kinds of variations for meeting the richness requirements of the instruction.

Guidelines

- Do not yet repeat Step 6 for each remaining skill and knowledge in this block. It is better to do Steps 5-8 together for a single skill or knowledge, and then cycle back for the next one.

Outputs

For the Application Model

- a. An outline for the generality.
- b. A "blueprint" for the nature of the examples and practice.

For the Remember Model

- a. An outline for the presentation.
- b. A "blueprint" for the nature of the practice.

Example:

For the unit "Combat communications FM24-1":

1. Generality:

- Presentation of the concepts and principles which make up the unit in a clear, concise, appealing way.
- Statements of the concepts and principles should be presented in a meaningful context.
- Case histories can be used as grabbers in the briefing of each presentation.
- Examples should be provided to clarify concepts and principles.
- Depending on difficulty of concepts and principles, adjust the number and generality of examples. (See ARM for how)

2. Examples:

- Plan an instructional period to present a context that the learners will see how the concepts and principles they are learning will apply.
 - Choose a realistic context.
- Plan for processing time on the example, i.e., discussion time, resources, people, etc.

3. Practice:

- As a result of an analysis of the expected final performance on the course objectives, plan to have similar activities in class or outside as instructional activities.
- Provide opportunity and direction to learners in a non-threatening environment for them to (test) apply their learning. Always follow practice with meaningful, constructive, corrective feedback and relate this to their past, present and future learning.

Therefore the blueprint for this step would look like this:

1. Generality:

- Presentation of concepts and principles as stated descriptions on print material, accompanied with other media representations.
- Examples

2. Demonstration

- Planned example activity expository, discussion, question and answer period, resources.

3. Practice

- Number of practice events, feedback sessions, directions for further learning.

STEP 7 PLAN THE ENRICHMENT COMPONENTS

Decide on the richness and motivational requirements for the instruction, and plan what enrichment and motivational components should be included (if any). Richness requirements are assessed on the basis of the difficulty level of the task in relation to the ability level of the learners.

Purpose

Very "lean" instruction might be satisfactory for very bright learners and/or for teaching a very simple task. It is, however, important to increase the richness of the instruction for lower-ability learners and/or for more difficult tasks. Instruction that is not rich enough will be less effective and will frustrate the learners. Instruction that is too rich will likely also be less effective because of having "muddied the waters", and it will bore the learners. Similarly, some tasks are highly motivating while others are not, and some learners are highly motivated while others are not. Instruction that does not have enough motivational enrichment will turn learners off, and learner effort is a major factor in the effectiveness of the instruction. On the other hand, instruction that has too much motivational enrichment will distract the learners and reduce the effectiveness and appeal of the instruction.

Inputs

- a. Learner analysis.*
- b. The "blueprints" from Steps 5 and 6.
- c. Experienced instructor (EI).

* Note: If the EI is very familiar with the target learners, no prior learner analysis is needed.

Substeps

7.1 With the help of an experienced instructor (EI) -- that is, someone who has had experience in teaching this content to the target audience of learners -- select the appropriate level of richness (on a scale of 1 to 5) for the instruction on this skill or knowledge. This decision should be based on the lowest-ability-level learner in the target population, unless you are planning on procedures and resources for extensive remediation.

- If it is very easy for the learner to learn, considering the learner's ability, prior knowledge, and experience, then select very lean instruction (give it a 1).
- If it is very difficult, considering the learner's ability, prior knowledge, and experience, then select very rich instruction (give it a 5).
- If it is in between with respect to difficulty for the learner to learn, then give it a 2, 3, or 4.

If the instruction should be lean, just plan to use the strategy components outlined above.

7.2 For the remember model, help the EI to decide how many presentations, practice, and test items should be used in the instruction.

- This is based to some extent on the amount of variation identified in Substeps 6.7 and 6.8.
- This is also based heavily on the desired level of richness from Step 6 above. As the richness level increases, you should plan to increase the number of repetitions.

- Refer to the Advanced Reference Manual (ARM) for other strategy components that can be used to help the learners to remember, such as memory devices (rhymes, songs, associations, etc.) and alternative representations (paraphrases, visuals, audio, etc.).
 - Even for a richness level of 1, it is usually advisable to have several practice items, preferably spaced (presented at different points in time). This gives an opportunity for learners to test their memories.
 - Consider the lowest entry level learner in making this decision.
- 7.3 For the application model, help the EI to decide how many examples, practice items, and test items should be used in the instruction.
- This is based to some extent on the amount of variation that exists among the instances of the skill or knowledge (from Step 6). This is the basis for Markle's notion of a "rational set" of instances.
 - It is also based heavily on the desired richness level. The higher the richness level, the more "rational sets" you should use for the examples and practice.
 - Refer to the ARM for other strategy components that can be used to help the learners to learn to apply the skill or knowledge, such as attention focusing devices (underlining, bold type, formatting, etc.) and alternative representations (paraphrases, visuals, audio, etc.).
 - Even for a richness level of 1, it is usually advisable to have a couple of examples and practice items. This helps generalizability and provides an opportunity for learners to test their own understanding.
 - Consider the lowest entry level learner in making this decision.
- 7.4 Help the EI to determine the motivational requirements of the instruction, based on both the nature of the skill or knowledge and the motivational profile of the learners, and plan (1) the general nature of the motivational components and (2) the amount or magnitude of each of those components needed to meet those requirements.
- Be sure to assess those requirements in all four areas: attention, relevance, confidence, and satisfaction (ARCS). See the TRADOC report by Keller and Dodge for specific procedures and guidelines.

Outputs

- a. A richness rating of 1 to 5 for the instruction on this single skill or knowledge.
- b. An indication as to the required and suggested enrichment components for the instruction (e.g., specification of the number of examples and practice items or the number of repetitions).

STEP 8 SELECT A PRESENTATION APPROACH

Decide on an approach by which instruction should occur:

Professional tutoring	Lecture (or demonstration)
Peer tutoring	Group discussion
Individualized resources	Group activities
Individual projects	Group projects

Purpose

There are several different approaches that can be used for presenting instruction. Too often designers select lecture or individualized resources without first determining whether an alternative approach might be better. Poor choice of an approach can have devastating effects on the effectiveness and appeal of the instruction.

Inputs

- a. Task descriptions from the task analysis (for characteristics of the desired performance).
- b. The results of Steps 5, 6, and 7 (for characteristics of the instruction).
- c. Availability of resources.
- d. Institutional rules and regulations.

Substeps

8.1 Select the most appropriate approach or combination of approaches for teaching this skill or knowledge. The following are some of the major approaches* that you ought to consider, but you might also think of others:

Professional tutoring	Lecture (or demonstration)
Peer tutoring	Group discussion
Individualized resources	Group activities
Individual projects	Group projects

* Notes:

1. This should be a fairly complete listing of approaches. It is based on the premise that the source of the instruction can be a professional instructor (as in lecture and professional tutoring), an amateur or peer (as in discussion and peer tutoring), a planned environment or resources (as in individualized resources and group activities), and a real-world environment or resources (as in projects). It is also based on the premise that the receiver of the instruction can be an individual learner (as in tutoring, individualized resources, and individual projects) or a group of learners (as in lecture, group discussion, group activities, and group projects).
2. The individualized resources approach includes objects, paper resources, electronic resources, and films. A similar variety of media can be used in lecture. Criteria for selecting among such subcategories appear within the corresponding category.

Use your best judgment as to which of these approaches (or which combination of approaches) is likely to be best. The following guidelines may help you to make the decision, but do not let this keep you from using your intuition or any other criteria:

- Think in terms of the ideal. Do not at this point assume that institutional constraints and resources will prevent the use of any approaches. This concern is dealt with in Step 9.
- Individualized resources are most appropriate most often.
- In some cases individualized resources may either be supplemented with or used by another approach.
- Attitudes: If attitudes are a major concern, then use tutoring, group discussion, lecture, or film to implement modeling and/or sharing of perspectives.
- Resources: If there is little time and/or money to develop good individualized resources, then use any of the other formats.
- Feedback Requirements: If the practice entails large variability of correct responses, or if the responses to the practice are either oral or difficult to self-evaluate, then use either tutoring, interactive lecture, or group activities.
- If teamwork is required in the real-world task, then use group activities or group projects, (probably to supplement rather than to replace individualized resources).
- Motivation: If motivation is likely to be a problem because of the nature of the learners or the task, then precede the instruction with a motivational lecture or film, and/or make heavy use of instructional games (either in individualized resources or group activities) or tutoring.
- Individualized resources tend to be especially useful when the instructional content has high information requirements; that is, when there are many aspects of the content that need to be considered in order to learn the desired performance.
- See Table 1 for a summary of these and additional guidelines.

8.2 Having selected an approach or combination of approaches for this skill or knowledge, check Table 1 (next page) to make sure that it is feasible.

Note: In most circumstances, a combination of approaches may be best. Within the limited scope of this manual, procedures and guidelines for combining these approaches are not provided, but designers/developers should carefully consider combinations of approaches based on their own experience and on combinations used by other experienced developers. (It seems quite likely that some approaches may be well-suited for practice, while others may be well-suited for presenting information or demonstrations).

					P	D
					T	E
					E	E
	Alternate				A	R
					C	C
	Presentation				T	H
					T	T
	Formats				U	R
					I	E
					R	T
					O	I
Selection					O	A
					R	T
Criteria					O	I
					O	I
					R	O
					N	
					G	N
Group consensus needed		X				
Group cohesiveness important			X			
Student cooperation sought	X	*	X			
Need to alleviate anxiety caused by group work					X	
4. Feedback Requirements						
Not required						*
Immediate, individual feedback needed					*	
Feedback by peers important		X				
Responses difficult to evaluate					X	
Wide range of responses possible					X	
Evaluation conducted in natural environment	X					
5. Motivational Factors						
Students are low achievers			X			
Human interaction important				X		
Need to arouse interest	*					X
6. Attitudinal Factors						
Sensitive issue requiring out-of-ordinary solution		X				
Attitudes toward ethnic groups involved		*	X			
Human modeling of attitude important				X		
7. Resources Considerations						
Large number of students						X
Too few teachers						X
Insufficient/inadequate instructional materials						X
Expensive materials						*
Individual records to be managed	*				*	

STEP 9

REPEAT, AND REVIEW AND REVISE APPROACHES

Repeat Steps 5-8 for each of the skills and knowledges in this block. Then review the choices of approaches for resource and logistical feasibility, and revise as necessary.

Purpose

The ideal approach is sometimes not possible due to lack of sufficient resources (for either developing or running the program) or other kinds of situational constraints at the target site of the instruction. In such cases, it is necessary to compromise on the ideal, but only after thoroughly exploring all means of securing the necessary resources or institutional changes.

Inputs

- a. The results of Step 8 (after repeating for all skills and knowledges in this block).
- b. The general motivation plans (from Step 7).

Substeps

9.1 Repeat Steps 5-8 for each remaining skill or knowledge in this block of this unit.

9.2 Check on institutional resources in the target instructional environments. In cases where necessary resources (material or human) are not already available, decide whether it would be cost effective (in relation to the costs and benefits of alternative approaches) to try to obtain them. If yes, then check for ways that they might be obtained. This may require considerable time and resourcefulness on your part.

9.3 In cases where it will be either impossible or not cost effective to obtain the necessary resources for an approach, go back to Step 8 and select the next best approach or combination of approaches.

9.4 Check on the logistical feasibility of the choice of approaches for the intended instructional environment. In cases where the logistics do not permit the use of an approach or combination of approaches, decide whether it would be cost effective (in relation to the costs and benefits of alternative approaches) to try to change the target institution(s). If yes, then check for ways that changes might be made in the target institution(s) that would allow the use of your chosen approaches.

- The choices would be logistically infeasible if they required frequent hopping back and forth between several approaches, where those approaches required different physical locations. Such frequent "migrations" would disrupt the learning process, and "second-best" approaches that avoided this disruption would likely be superior. However, moderately frequent changes of approaches might provide a

welcome change.

9.5 In cases where it will be either impossible or not cost effective to obtain the necessary changes, go back to Step 8 and select the next best approach or combination of approaches.

9.6 Check on your instructional development resources and constraints to make sure that you can develop the chosen approaches and that such is cost effective in relation to alternative approaches. If not, then go back to Step 8 and select the next best approach or combination of approaches.

9.7 Review and coordinate the general motivation plans (from Substep 7.4) for each block.

- Be sure to consider requirements in (and hence strategies for) all four aspects of motivation: attention, relevance, confidence, and satisfaction. Specific guidance is provided by TRADOC documentation entitled "The ARCS Model of Motivational Strategies for Course Designers and Developers" by John Keller and Bernard Dodge.

Outputs

- a. Finalized decisions on Step 8 for all skills and knowledges in the block.
- b. A motivation plan for the block.

CHAPTER 3
DEVELOP THE INSTRUCTION

Overview

For each unit:

For each block:

10. Review, select and revise existing materials
(Block III.3 of IPISD).

11. Create resources and guidance:

Individualized resources

Group activities

Lecture

Tutoring

Discussion

Projects

12. Develop block summarizers and synthesizers.

Next block.

Evaluate and revise (Block III. 5 of IPISD).

Next unit.

STEP 10

REVIEW, SELECT AND REVISE EXISTING MATERIALS

Go to Block III.3 of the IPISD for guidance on reviewing and selecting existing materials. Be sure to compare the materials with the specifications laid out by the blueprints that you have developed in the previous Steps of EDeP. Then use the appropriate approach in Step 11 to revise the materials according to those specifications.

Purpose

Utilizing existing materials can save you much time and money in the instructional development process, even if all you do is borrow some of the examples and/or practice items.

Inputs

- a. The blueprints (from Steps 5-7).
- b. The selection of an approach or combination of approaches (from Step 9).

Substeps

10.1 Review and select existing materials that will save development time and money.

- Try to find materials that meet the specifications for approach(es) (from Step 9) and strategies (from Steps 5-7). This will save you even more development time and money.
- Use Block III.3 of the IPISD for additional guidance.

10.2 Revise those materials so that they conform with the specifications for approach(es) and strategies.

- Use the appropriate parts of the appropriate Step 11 alternative (for example, the appropriate substeps for Lecture -- Alternative 3 of Step 11). Also resequence the content according to the specifications from Steps 1-4.

Output

- a. Revised materials that meet the design specifications from Steps 1-9.

STEP 11
CREATE THE INSTRUCTIONAL RESOURCES AND/OR GUIDANCE

On the basis of the approach(es) selected in Steps 8 and 9, create all instructional resources and/or instructor's guides for which you were not able to find any suitable existing materials. This includes all development and production activities.

Purpose

To produce the instruction according to the specifications or "blueprints" created so far.

Substeps

11.1 Use the appropriate sections of the UM and ARM to produce the instructional resources and instructor's guides for this block.

• Where to Look for Guidance:

<u>Approach</u>	<u>Location</u>
Individualized Resources	UM, p. 33, ARM, p. 17
Group Activities	ARM, p. 26
Lecture	ARM, p. 39
Tutoring	ARM, p. 50
Group Discussion	ARM, p. 70
Projects	ARM, p. 75

11.2 If Step 9 calls for using more than one approach for this block, then integrate the approaches.

- This is done primarily by preparing an integrated instructor's manual -- one that combines all of the instructor's manuals for this block and explains which approaches are to be used when.

STEP 12 DEVELOP THE BLOCK SUMMARIZERS AND SYNTHESIZERS

Create a summarizer that reviews each concept, principle, and fact taught in the block; create a synthesizer that integrates any interrelated concepts or principles taught in the block; create a summarizer that integrates and reviews all steps taught in the block; and make and implement a plan for the timing and frequency of these summarizers and synthesizers.

Purpose

Systematic review can have a very noticeable impact on a soldier's ability to perform the required tasks when he or she reaches the field. Also, explicitly teaching relationships within the content (referred to as synthesis) can improve meaningfulness, understanding, motivation, and retention.

Inputs

- a. All the outputs from Step 11.
- b. EI.

Substeps

12.1 For each principle and concept listed for this block, help the EI to write (a) a concise statement of the generality, (b) a prototypical example, and (c) a previously unencountered, self-test, practice item with feedback. Put these at the beginning of the summarizer.

12.2 For each fact listed for the block, help the EI to write (a) a concise statement of the fact and/or (b) a self-test practice item with feedback. Also, put these at the beginning of the summarizer.

- You may want to group the self-test practice items from Substeps 12.1 and 12.2 and place them after all the generalities, examples, and fact statements.
- You may also want to make it difficult for the learner to peek at the feedback or the earlier information.

12.3 If there are many interrelated concepts or principles that are taught in the block, then help the EI to develop a way to portray the interrelationships. Put these synthesizers immediately after the content that each synthesizes.

- Interrelationships among concepts are often best taught with a tree chart in which the lower concepts (boxes on the chart) are either kinds or parts of the higher concept (box) to which they are attached (see Glossary for more about tree charts). Practice in remembering the relationships may also be helpful.
- Interrelationships among principles are often best taught with a set of boxes and arrows which indicate how the effects in one principle are causes in another. Again, practice in remembering these relationships may also be helpful.

12.4 Help the EI to develop a rule synthesizer -- that is, a way to portray the sequence of the individual steps taught in the block, plus any highly related steps that were taught in earlier blocks. This should appear next in the summarizer.

- Usually, a flowchart will be an effective way to portray the sequence of the individual steps.
- If there are two or more unrelated rules, create one rule synthesizer for each.

- You may be able to lump several steps together into a single, slightly more general step that will be sufficient to stimulate the learner's memory of all of those steps.

12.5 Have the EI develop several integrated examples and practice items with feedback (that is, examples which illustrate the sequence of steps for specific cases and practice items which require the use of the proper sequence for specific cases) for each rule or set of related rules. Every step that was taught in this block should be illustrated in at least one example and self-tested in at least one practice item. This should appear next in the summarizer.

12.6 Plan for the summarizer to be presented at the end of the block. Also, plan to present it (with a different self-test practice item) periodically during the unit (say once every 3-6 blocks), unless the skill or knowledge will be used at least that frequently during the rest of the unit.

12.7 Repeat steps 5-12 for each block in the unit.

Outputs

- a. For each block of this unit, a summarizer consisting of (1) a concise generality, a prototypical example, and a new practice item with feedback for each principle and concept; (2) a concise statement of the fact and a practice item with feedback for each fact; and (3) an integrated generality, integrated examples, and integrated practice with feedback for each rule or set of related rules taught in the block.
- b. For each summarizer, an indication of how often and when it will be presented, in addition to its presentation at the end of its block.
- c. For each block of this unit, synthesizers that explicitly teach the important interrelationships among related concepts or related principles that are taught in the block (if any), presented immediately after the content that each synthesizes.

END OF EDeP

Go to Block III.5 of the IPISD to evaluate and revise this unit. Then repeat Steps 5-12 for the next unit.

We suggest one addition to the IPISD's suggestions for evaluation and revision: solicit a content review by a new SME and/or EI. Have him or her look for inaccuracies in the content rather than inadequacies in the instruction (e.g., make sure your examples are in fact examples of the generality).

UNIT 2
INDIVIDUALIZED RESOURCES

CHAPTER 4
INDIVIDUALIZED RESOURCES

ALTERNATIVE 1 FOR STEP 11
CREATE THE INSTRUCTIONAL RESOURCES AND GUIDANCE

Overview

- For each skill or knowledge:
 - Decide on game or non-game format.
 - 11.1 Next skill or knowledge.
- For non-game format:
 - For each skill or knowledge:
 - 11.2 Plan motivational strategies.
 - Next skill or knowledge.
- For each skill or knowledge:
 - 11.3 Decide on an optimal medium or media.
 - Next skill or knowledge.
 - 11.4 Make final media selection.
 - For each skill or knowledge:
 - For application model:
 - 11.5 Create generality and an instance pool.
 - 11.6 Assign and sequence instances.
 - 11.7 Write examples, practice, test items.
 - For remember model:
 - 11.8 Write presentations, practice, test items.
 - Next skill or knowledge.
 - 11.9 Develop guidance for learners.
 - 11.10 Develop an instructor's manual.

STEP 11.1 DECIDE ON GAME OR NON-GAME FORMAT

This step entails deciding, for all content allocated to individualized resources, whether or not the instruction should be in the form of a game.

For all skills and knowledges for which a game format is selected, refer to the ARM for all further guidance.

For all skills and knowledges for which a non-game format is selected, proceed with the remaining steps in this Chapter.

Purpose

For some kinds of tasks, especially some rote memorization tasks, educational games can be more appealing and more effective than non-game resources. How well-motivated the learners are has a considerable effect on how quickly they learn, how much they learn, and how long they remember. You can include strategies that will directly influence the motivation of the learners.

Inputs

- a. Block objectives.
- b. Institutional resources.
- c. Learner characteristics.
- d. Motivation plan (from Step 9 above).

Substeps

11.1.1 Pick a skill or knowledge allocated to individualized resources, and decide if a game format should be used.

- Games are particularly useful where the task is of such a nature that its mastery requires extensive practice and consolidation.
- Games can be effective for both simple and complex cognitive tasks. For remember-level tasks, they can improve motivation. For application-level tasks, they can provide a realistic structure.*
- Games can enhance attitudinal objectives.
- Games can illuminate individual and group decision-making.
- Where rote repetition and learning from mistakes are appropriate learning conditions, games are usually very effective.

Cautions

- It should be assumed that only some knowledge and skills presented via games will be learned, and that things will be learned besides the intended knowledge and skills.
- The learner's active involvement may help to overcome apathy and indifference, but there may be danger from excessive involvement and commitment.
- Games tend to require more time to use than traditional techniques because they can be more profound and tend to provide experiential learning.

11.1.2 Repeat Step 11.1.1 for each remaining skill and knowledge in this block.

- For each game refer to the ARM for all remaining guidance.
- For all skills and knowledges for which a non-game format was selected, proceed with this Chapter.

* Note: Games usually require more time than non-game instruction, so be sure there is a need for what is contributed by whatever game you have in mind.

Output

- a. A decision on whether or not to use a game format for the individualized resources.

STEP 11.2
FURTHER PLAN THE MOTIVATIONAL STRATEGIES

For each non-game skill and knowledge, decide on specific motivational strategies to use.

Inputs

- a. General motivation plan (from Step 9)
- b. EI

Guidelines

- Be sure to consider requirements for attention, relevance, confidence, and satisfaction. For guidance refer to TRADOC documentation, "The ARCS Model of Motivational Strategies for Course Designers and Developers" by John Keller and Bernard Dodge.

Output

- a. A plan for what motivational strategies to use for all non-game instruction in the block.

STEP 11.3 DECIDE ON OPTIMAL MEDIA FOR EACH SKILL

Decide on the optimal medium or combination of media for teaching the skill or knowledge under consideration. Consider only the availability of necessary resources and the cost effectiveness of the alternatives at this point.

Purpose

Different sensory inputs, presentation capabilities, and response capabilities are required for learning different skills and knowledges. Also, increased motivational outcomes of learning can often be achieved by using the appropriate medium or combination of media.

Inputs

- a. The results of Steps 5, 6, and 7.
- b. EI or knowledge of learner characteristics, including motivation level.
- c. Resource and logistical constraints.

Substeps

- 11.3.1 Review and prioritize factors for media selection.
 - The following are some of the relevant factors to be reviewed:
 - Nature of practice
 - Nature of examples or alternate representations
 - Complexity of the generality or information
 - Motivation level of the learners
 - Any other special needs of the learners.
 - The most important constraints or requirements should be identified for use in media selection.
- 11.3.2 Select the most desirable of the available (or obtainable) media.
 - Be sure to take into consideration such things as
 - the cost effectiveness of the media
 - flexibility in use
 - management of the media.
- 11.3.3 Repeat Step 11.3 for each remaining skill and knowledge in this block.

Output

- a. A prioritized list of the media alternatives for each skill and knowledge.

STEP 11.4 MAKE FINAL MEDIA SELECTION

This step involves compromising on the cost-effective "ideal" media (from Step 11.3) by eliminating disruption from too-frequent switching from one medium to another or by eliminating boredom from too little variation in media.

Purpose

If the instruction switches back and forth among several media too frequently, then it will disrupt the learning process. Also, if the instruction relies on a single medium for teaching the entire block, then it is likely to produce boredom. Hence, the instruction will be better overall if you compromise on the cost-effective "ideal" in such cases.

Inputs

- a. The results of Step 11.3.
- b. EI.

Substeps

11.4.1 Look at the results of Step 11.3 and assess the amount of variation in media use. If there is too little variation and it seems likely that this might increase boredom with the instruction, then try to identify ways that additional media can be used effectively.

- The amount of variation is determined by two factors: the variety of media used and how frequently the instruction switches from one medium to another.
- Also consider the amount of variation in approaches used in the block (see Step 8 of the design procedure above).

11.4.2 Check on the amount of disruption that is likely to be caused by switching from medium to medium. If there is too much disruption, then reduce the amount of disruption by (1) compromising on the most cost-effective medium (i.e., selecting the next best medium for some of the skills and knowledges in the block) and/or (2) compromising on the optimum sequence of skills and knowledges in the block (i.e., grouping the skills and knowledges according to the media that they require).

- The amount of disruption is not determined so much by the frequency of switches from one medium to another as by the nature and location of the media involved. If two media can be used in the same place at the same time (such as a computer and some written materials both being used at a single learning station), then frequent changes from one to the other are not likely to be disruptive at all.
- Loss of time and interruption of thought are two important considerations in assessing amount of disruption.

Outputs

- a. Final decisions as to what media to use for each skill and knowledge in the block.
- b. Possibly some modifications in the sequence of skills and knowledges in the block.

STEP 11.5
APPLICATION MODEL:
CREATE THE GENERALITY AND AN INSTANCE POOL

If the skill or knowledge is to be taught at the application level, then use this Step. Otherwise, go to Step 11.8.

Write the generality, and develop all of the instances that were specified in Steps 5-7.

Purpose

It is in this step that you first begin to actually create the instruction that will be given to the learners. To develop the examples, practice items, and test items, it is strongly recommended that you create a single pool of instances and randomly assign those instances for use as examples, practice, or test items. This helps to ensure consistency, objectivity, and representativeness for each of these components of the instruction. The specifications for this pool of instances were prepared in Step 6 above. And to collect or create the instances, it is helpful to have a fully developed generality for the skill or knowledge.

Inputs

- a. Desired performance level (remember or apply).
- b. Instance pool specifications from Step 6 above.
- c. Media specifications from Step 11.4 above.
- d. Several EIs and/or SMEs.

Substeps

11.5.1 Develop the generality.

- The generality in individualized resources should be very clear, complete, and easy to understand. It should not require any further explanation from another resource. In other words, it should contain all of the information that the soldier needs to be able to do the desired performance.
- Do not include irrelevant or "nice to know" information. The generality should be worded simply and concisely.
- At this point, do not create any enrichment components that may be needed for the generality.

11.5.2 Help the EI to identify common errors, mistakes, or problems that learners are likely to make or encounter during the learning process.

- These will be used as "distractor" practice and test items; and, in the case of concepts, they will also be used as nonexamples.

11.5.3 Have the EI describe or create a few instances that (1) clearly demonstrate all (or as many as possible) of the critical and variable characteristics. Give feedback and guidance for the EI's effort.

11.5.4 Send the EI off to create a complete pool of instances.

- The pool should be about 20% larger than what is needed for all examples, practice items, and test items, because you will likely want to reject close to one in five of them (see Step 11.6 below).
- Ideally you will have three or four EIs at this stage in the development process. Experience has indicated that a designer can handle about that number, depending on experience.
- Do not spend time fully developing the instances yet, for no decision has yet been made as to which ones will be used as examples, which ones as practice, and which ones as test items.
- Make sure that the EI selects instances which represent a broad range of difficulty, if such exists.

Outputs

- a. A generality for each application-level skill and knowledge in this block.
- b. A pool of instances that will be used for the examples, practice, and test items.

STEP 11.6
APPLICATION MODEL:
ASSIGN AND SEQUENCE INSTANCES

If the application level is the desired level of instruction, then do this step next. Otherwise go to Step 11.8.

Review and (if necessary) revise the instance pool, identify the difficulty level of each instance, assign the instances to the major components of the instruction (examples, practice, and test), and sequence the instances within each major component.

Purpose

This step affords an opportunity for "quality control" over the instances. Also, the procedure for assigning them to the major components of the instruction helps to insure sufficient variation within the instruction (which improves learning) and within the test (which improves the validity of the assessment).

Inputs

- a. The instance pool from Step 11.5.
- b. EIs (preferably several).

Substeps

11.6.1 Review the EI's instance pool, and request modifications if necessary.

- Check for any instances that do not illustrate the critical characteristics, and modify or delete them.
- Check for sufficient representation of each variable characteristic, and request additions of certain types of instances if necessary.

11.6.2 Help the EI to divide the instances into three "piles": easy, medium, and hard. Also make sure that there is a sufficient number of each.

- The number of instances does not have to be the same in all three piles. If the task is quite easy, you may not want as many easy instances.
- Difficulty level is often very hard to assess. If the EI has a lot of experience teaching the task, then he or she can probably just make an intuitive assessment. Otherwise, you may want to test the instances on a sample of the target learners to collect data as to their difficulty levels.

11.6.3 Assign the instances more or less randomly from each difficulty "pile" to the major components of instruction (examples, practice, and test); but be sure that there is equal representation of variable characteristics in the examples, practice, and test. The total number that is assigned to examples, practice, and test was determined in Step 6 above.

11.6.4 Sequence the instances within each category (examples, practice, and

test).

- The examples and practice items should (1) be in an easy-to- difficult sequence and (2) be sequenced so that each instance is as different as possible from the previous one.
- For concepts, a few (depending on richness level) non-examples should be paired with examples that are as similar as possible to them.
- The test items should be randomly sequenced.

Output

- a. A chronological list of the instances that will be used in each major component of instruction. The chronology is the order in which they will be presented (or made available) to the learner.

STEP 11.7
APPLICATION MODEL:
WRITE THE EXAMPLES, PRACTICE, AND TEST ITEMS

If the application level is the desired level of instruction, then do this step next. Otherwise go to Step 11.8.

On the basis of the motivational-strategy and richness-level prescriptions, add motivational and informational enrichment to the generality (if necessary), produce the examples, practice, and test items complete with any needed enrichment components. Also add a review of prerequisites or context if necessary, create a demo or some other component to inform the learner of the objective if necessary, and create any internal "wrap-around" for teaching this skill or knowledge.

Purpose

This is the step during which the real "meat" of the instruction is developed. Good generalities, examples, and practice are essential to effective and appealing instruction. Review of prerequisites and context and knowledge of the objective also help to make the learning easier and more meaningful.

Inputs

- a. Motivational-strategy prescriptions (from Step 11.2)
- b. Richness-level prescriptions (from Step 7).
- c. The generality (from Step 11.5).
- d. The assigned and sequenced instances (from Step 11.6).
- e. Identification of prerequisites from the task analysis.
- f. Knowledge of other skills and knowledges being taught in this block.
- g. Knowledge of the objective for this skill or knowledge.
- h. EIs (preferably several).

Substeps

11.7.1 Review the motivational-strategy and richness-level prescriptions, and plan how to implement them with the generality, examples, practice, and "wrap-around" instructions.

- See the ARM for more about enriching the instruction.

11.7.2 Add any planned enrichment to the generality.

- This may be informational enrichment, such as visual representations or attention-focusing devices, or it may be motivational enrichment, such as ways of increasing relevance or confidence. Analogies often provide both kinds of enrichment simultaneously.

11.7.3 Produce the practice and test items, but no feedback yet.

- There should be no informational enrichment on the stimulus portion of the practice items, which is all you are writing at this point.

11.7.4 Produce the examples and practice feedback, complete with any planned enrichment.

- Especially for the early examples, and feedback it is not sufficient to just present the instance; the instance must also be related to the generality. In other words, the example and practice feedback should contain not only the instance but also notes, commentary, or other kinds of devices to focus the learner's attention on why it is or is not an example.
- Again, the enrichment may be motivational as well as informational, depending on the requirements for the instruction. Anecdotes are often very effective at both, as long as they are highly relevant.

11.7.5 Create a brief review of prerequisites and/or statement of context for the new knowledge or skill, if necessary, and put it before the generality.

- A statement of context shows where this particular knowledge or skill fits within the larger picture of the whole block's content.
- Prerequisites only need to be reviewed if it is likely that some learners will have forgotten them.
- Prerequisites are listed in the task description from the task analysis.

11.7.6 Create a component to inform the learner of the objective, if necessary, and put it before the generality.

- If the learner has a larger objective in mind (see "context" in Substep 11.7.5), then it is not always advisable to inform the learner of every little enabling objective.
- Usually a prototypical demonstration of the desired performance is a more effective, concrete, and appealing way of doing this than providing a verbal statement of the objective.

11.7.7 Create any "wrap-around" instructions or commentary that will improve the readability, motivational value, etc. of the lesson on this skill or knowledge.

- Be careful! Do not include "nice-to-know" material. It distracts the learner and interferes with learning in most cases.
- Useful wrap-around might include (1) instructions to the learner about how to process the information that is being presented, (2) motivational components, and (3) directions about what to do next.

Output

- a. A fully developed lesson for this skill or knowledge, including objective, prerequisites, context, generality, examples, practice, test, enrichment, and wrap-around.

STEP 11.8
REMEMBER MODEL:
WRITE THE PRESENTATIONS, PRACTICE, AND TEST ITEMS

If the knowledge is to be taught at the remember level, then use this step. Otherwise, go back to Step 11.5.

On the basis of the richness-level and motivational strategy prescriptions, write all of the presentations, practice, and test items for the information that is to be memorized, complete with any enrichment components. Also, write a brief statement of context, and create any "wrap-around" for teaching this knowledge.

Purpose

This is the step during which the real "meat" of the instruction is developed. Good presentations and practice are essential to the effectiveness and appeal of the instruction. Context and "wrap-around" can also make the learning easier and more meaningful.

Inputs

- a. Desired performance level (remember or apply).
- b. Prescribed instructional strategies (from Steps 5-7).
- c. Motivational strategy prescriptions (from Step 11.2).
- d. EIs and/or SMEs (several, if possible).
- e. Knowledge of other skills and knowledges being taught in this block.

Substeps

11.8.1 Review the motivational-strategy and richness-level prescriptions, and plan how to implement them with the presentations and practice.

11.8.2 Produce the presentations, complete with any planned enrichment.

- This may be informational enrichment, such as attention-focusing and memory devices, as well as the alternative representations identified in Step 7, or it may be motivational enrichment, such as ways of increasing relevance and confidence. Anecdotes are often effective at doing both simultaneously.
- Be sure to include all prescribed enrichment components.
- If there is considerable information to be memorized (say, more than 7 plus or minus 2 pieces), then break it into chunks, and plan to teach each of those chunks separately, using all appropriate strategy components for one chunk before using any strategy components for the next chunk. (Integration should occur after all chunks have been memorized -- see Step 12 for details.)
- Do not include irrelevant or "nice-to-know" information. The information should be worded simply and concisely.

11.8.3 Produce the practice, complete with any planned enrichment.

- Make sure that the stimulus in your practice is consistent with the job-environment stimulus, and that the response required of you practice is similar to the job-environment response. If either part of the information can serve as the stimulus on the job, be sure to similarly vary your practice as to which part is the stimulus and which the response.
- The enrichment may be motivational as well as informational, but all informational enrichment should appear on the feedback and not on the stimulus portion of the practice.

11.8.4 Create a brief statement of the context of the information that is to be learned, if necessary; and put it before the presentation of the information.

- A statement of context shows where this particular knowledge fits within the larger picture of the whole block's content.

11.8.5 Create any "wrap-around" instructions or commentary that will improve the readability, motivational value, etc. of the lesson on this information.

- Be careful! Do not include "nice-to-know" material. It distracts the learner and interferes with learning in most cases.
- Useful wrap-around might include (1) instructions to the learner about how to process the information that is being presented, (2) motivational components, and (3) directions about what to do next.

11.8.6 Repeat Steps 11.5 - 11.8 for every skill and knowledge in this block. Be sure to add any transitions that are appropriate.

Output

- a. A fully developed lesson for this information, including context, presentation, practice, test, enrichment, and wrap-around.

STEP 11.9 DEVELOP GUIDANCE FOR STUDENTS

Develop any helpful introductory instructions to the learner about how to learn from the individualized resources.

Purpose

This guidance makes it easier for the learner to use the instructional resources.

Inputs

- a. Learner level of sophistication.
- b. Complexity of the task(s).
- c. Richness of the instruction.

Substeps

11.9.1 If the learner is not familiar with the use of a certain resource, prepare instructions about how to use it.

- These may include instructions about how to use the computer or how to use lab materials.

11.9.2 Decide how much control the learner should have over his or her instruction. This includes control over: pacing, scheduling, and instructional strategy.

11.9.3 Whatever the learner is given some control over, some guidance and suggestions should be provided to the learner about how to control it, unless you are quite sure that the learners all already possess such knowledge. Such guidance should be included in the learner's manual, which can be a preface to any written materials that are used in the instruction, or can be a stand-alone manual. It might include some of the following:

- If the learner is given control over instructional strategy, the learner's manual should include information on how and when to switch back and forth between the generality, examples, and practice. This entails knowing what each of those components is like and for what each can be useful during the learning process. Such materials should also include information on the use of enrichment components such as alternative representations and memory devices. Also, some mastery learning principles, such as how to use practice and feedback as a self-test to determine one's readiness to move on to the next piece of instruction, should also be included.
- For control over scheduling, time criteria can be introduced as a suggestive frame of reference.

Output

- a. A complete learner manual that makes it easier for the learner to use the instructional resources.

STEP 11.10
DEVELOP AN INSTRUCTOR'S MANUAL

Develop an instructor's manual to accompany the individualized resources. Different forms of instructor's manuals should be considered. Refer to Block III.2 of the IPISD.

Purpose

Successful implementation and maintenance of any instructional system depends on the attitudes and knowledge of the instructors who are responsible for it.

Substeps

11.10.1 Devote the first part of the instructor's manual to "winning over" the instructor -- convincing him or her of the merits of the instructional system you have developed.

11.10.2 Devote the rest of the manual to describing the System Master Plan (SMP). This should specify plans for the implementation and management of the instructional system. In other words, it explains how the instructor can achieve the best results with the instructional system.

- See Block III.2 of the IPISD for guidance. Be sure to include such things as preventing student procrastination, scheduling resources, monitoring student progress, etc.
- Use information mapping principles in designing the manual for effective message design.

Output

- a. The portion of the instructor's manual for this approach in this block.

GLOSSARY
OF
TERMS

Analogy - An idea which is very similar to the idea that is to be learned but which is outside of the content area of immediate interest. When such a highly related idea is already known by the learners, relating the new idea to it can greatly facilitate learning, especially when the new idea is very abstract.

Blueprint - The product of an instructional design activity which lays out design specifications in terms of prescribed instructional strategies.

Complexity (of generality) - Difficulty of content to be learned in terms of number of critical attributes, degree of unfamiliarity, number of interrelationships with other content, density of critical information, etc.

Concept - A class of objects, events or ideas which share the same characteristics or critical attributes.

Criterion (pl. criteria) - A standard that a learner must meet before he/she is judged to have mastered a skill.

Critical attributes - Those characteristics of a class which differentiate its members from those of other classes.

Demonstration - A form of example which usually entails some action or movement.

Divergence - The degree of difference between examples or practice items.

Entry level - The level of performance or knowledge characteristic of beginning learners.

Example - A specific instance or case of the skill or idea being taught.

Fact - A fact is information that is to be memorized. "My pen has no ink" is an example of a fact.

Feedback - Information about the correctness of a response and instructions for correcting errors.

Generality - A generality is a statement which applies to more than one instance or case. It may be: (1) the definition of a concept, (2) the statement of a procedure, or (3) the statement of a principle.

Individualized resources - Instructional materials or programs designed specifically to be used by learners on their own.

Information mapping - Prescriptions for layout of instructional displays in such a way as to facilitate learning. It includes prescriptions for formatting, separation, labelling and highlighting.

Instance - An instance is a specific case of a generality (concept, principle, or rule). It may be either an example or a practice item.

Instance pool - A collection of instances that will later be used as examples, practice, and test items.

Instructional approach - A method of instruction. As used in this manual, it refers to one of the following instructional methods:

- individualized resources
- group activities
- lecture/demonstration
- tutoring
- group discussions
- projects.

Instructional designer - Any person (military or civilian) who prescribes instructional strategies that meet a given set of instructional requirements.

Instructional developer - Any person (military or civilian) who follows a set of systematic procedures to design and produce instructional materials that will be used by instructors and learners.

Instructor's manual - An instructional management tool to help instructors to lead learners through an instructional program.

Job aid - A display intended to highlight the most essential aspect of a task while the person is performing the task.

Learner characteristics - Attributes, traits, or states of learners. Instructional designers attempt to identify those which influence the prescription of instructional strategies.

Learner control - Features of the instructional design which permit learners to control content selection, sequence, and/or other instructional components such as pace, practice duration, test frequency and others.

Learning guideline - Information that is given to the learner to facilitate the process of using the instruction.

Major components - The most important ingredients of an instructional presentation. Specifically, they may include generality, examples and practice.

Mastery - A predetermined level of success which learners are expected to attain as a result of instruction.

Non-example - An instance or case which does not exemplify the generality being taught. When presented along with an example that is as similar as possible to it, it helps to prevent learners from overgeneralizing.

Pacing - The rate at which new information is presented to the learner. Self-pacing indicates that the learner can control his or her pace.

Positive feedback - Immediate and unthreatening information that advises the learner about the correctness of his or her response and how to avoid any errors that may have been made.

Practice - An instructional activity in which a learner is expected to make an overt response (i.e., to do a performance).

Prerequisite - Any skill or knowledge that a learner needs to have acquired before a desired skill can be learned.

Principle - A change relationship. It is usually a cause-and-effect relationship.

Progression of difficulty - An easy-to-difficult sequence of examples or practice items.

Remember model - A set of strategy components which are prescribed as a unit to teach material that learners need to memorize.

Richness (of instruction) - The amount of support and guidance provided by the instruction. It is determined primarily by the number of examples, and practice, and the number and types of such things as memory devices, visuals, attention-focusing devices, analogies, and so forth that are included in the instruction in order to adjust the instruction to differences in complexity of the content and ability level of the learners.

Rule (procedure) - An ordered set of actions or steps to achieve a goal.

Sequence - The order of presentation of the parts of the instruction.

Subject-matter expert (SME) - A person who is highly knowledgeable in performing the task that is to be taught.

Strategy component - A characteristic of the instruction that is prescribed to meet an instructional requirement or requirements.

Tutoring - Teaching on a one-to-one basis. It is a situation in which one person provides help or guidance to a less experienced person.

Use model - A set of strategy components which are prescribed as a unit to teach material that learners need to be able to apply to new situations.

BIBLIOGRAPHY

- Allan, V.L. (ed) Children as Teachers: Theory and Research on Tutoring. New York: Academic Press, 1976.
- Ansdorf, E. Focusing: A teaching strategy to improve learning of mathematics. School Science and Mathematics, 1979, May/June, 431-433.
- Aronson, D.T., and Briggs, L.J. Contributions of Gagne and Briggs to a prescriptive theory of instruction. In C.M. Reigeluth (ed.), Instructional Design Theories and Models: An Overview of Their Current Status. Hillsdale, NJ: Erlbaum Assoc., 1983.
- Boutwell, R.C., and Van Mondfrans, A. A comparison of the structured tutoring model with criteria from idealized instructional models. Improving Human Performance, 1972, 1, 8-14.
- Collins, A., and Stevens, A. A cognitive theory of interactive teaching. In C.M. Reigeluth (ed.), Instructional Design Theories and Models: An Overview of Their Current Status. Hillsdale, NJ: Erlbaum Assoc., 1983.
- Colvin, R.J. I Speak English: A Tutor's Guide to Teaching Conversational English. Syracuse, NY: Literacy Volunteers of America, Inc., 1980.
- Colvin, R.J., and Root, J.H. Tutor: Techniques Used in the Teaching of Reading. Syracuse, NY: Literacy Volunteers of America, Inc., 1981.
- DeBloois, M.L. The Development of New Instructional Models. A study performed under Purchase Order No. OEC-0-71-3343, Bureau of Educational Personnel Development, Department of HEW, Office of Education.
- Denson, R.W. Team Training: A Literature Review and Annotated Bibliography. Educational Resources Information Center, 1979, (ED203027).
- Dickenson, G. and Verner, C. The lecture: An analysis and review of research. Adult Education, 1967, 17(2), 85-100.
- Dwyer, F. The communicative potential of visual literacy. Educational Media International, 1979, 2, 19-25.
- Ehly, S.W., and Larsen, S.C. Peer Tutoring for Individualized Instruction. Boston: Allyn and Bacon, Inc., 1980.
- Ellson, D.G. Tutoring. In N.L. Gage (ed), The Psychology of Teaching Methods (The Seventy-fifth Yearbook of the National Society for the Study of Education.). Chicago: University of Chicago Press, 1976.
- Gage, N.L., and Berliner, D.C. Educational Psychology. Chicago: Rand McNally College Publishing Company, 1975.
- Gagne, R.M., and Briggs, L.J. Principles of Instructional Design (2nd ed.). New York: Holt, Reinhart and Winston, 1979.
- Gerlach, V.S. Feedback in instruction: A review and suggestions for further research. Paper presented at the annual meeting of AERA, New Orleans, LA, 1973.

- Gropper, G. L. A behavioral approach to instructional prescription. In C.M. Reigeluth (ed.), Instructional Design Theories and Models: An Overview of Their Current Status. Hillsdale, NJ: Erlbaum Assoc., 1983.
- Harrison, G.V. Supervisor's Guide for the Structured Tutorial Reading Program. Provo, UT: Brigham Young University Press, 1972.
- Harrison, G.V. Tutoring: A remedy reconsidered. Improving Human Performance, 1972, 1, 1-7.
- Harrison, G.V. Structured tutoring: The key to effective use of human resources. Breakthrough, 1975, 3, 12-16. (Department of Special Education, Utah State University, Logan, Utah)
- Heinich, R., Molenda, M., and Russell, J.D. Instructional Media and the New Technologies of Instruction. New York: John Wiley and Sons, 1982.
- Higbee, K.L. Recent research on visual mnemonics: Historical roots and educational fruits. Review of Educational Research, 1979, 49, 611-629.
- Higbee, K.L. Some pseudo-limitations of mnemonics. Catalog of Selected Documents in Psychology, 1979, 9 (2), 1-13.
- Horn, R.E. How to Write Information Mapping. Cambridge, MA: Information Resources, Inc., 1976.
- Hulten, B.H. Games and Teams: An Effective Combination in the Classroom. Paper presented at the AERA Annual Convention, Chicago, 1974 (ERIC ED090927).
- Joseph, J.H. The Effect of Level of Knowledge of the Subject on the Instructional Effectiveness of Illustrations which Integrate Abstract and Realistic Visualization. Paper presented at the AECT Annual Convention, Denver, CO, 1980.
- Joyce, B., and Weil, M. Models of Teaching. Englewood Cliffs, NJ: Prentice-Hall, 1972.
- Kepner, C., and Tregue, B. The Rational Manager: A Systematic Approach to Problem-Solving and Decision Making. New York: McGraw-Hill, 1965.
- Keller, F.S. Good-bye Teacher ---. Journal of Applied Behavior Analysis, 1968, 1, 79-80.
- Keller, J.M. Motivational design of instruction. C.M. Reigeluth (ed.), Instructional Design Theories and Models: An Overview of Their Current Status. Hillsdale, NJ: Erlbaum Assoc., 1983.
- Kulhavy, R.W. Feedback in programmed instruction and text materials. Technical Note 77-1. San Diego, CA: Navy Personnel R and D Center, Oct. 1976.
- Kulhavy, R.W. Feedback in written instruction. Review of Educational Research, 1977, 47, 211-232.

- Kulhavy, R.W., Yekovich, F., and Dyer, J. Feedback and content review in programmed instruction. Contemporary Educational Psychology, April 1979, 4, 91-98.
- Landa, L.N. The alego-heuristic theory of instruction. In C.M. Reigeluth (ed.), Instructional Design Theories And Models: An Overview of Their Current Status. Hillsdale, NJ: Erlbaum Assoc., 1983.
- Levin, J.R. Pictures for school learning: Practical illustrations. Report from the Project on Studies in Language: Reading and Communication. Wisconsin R and D Center, University of Wisconsin, October 1980.
- Levin, J.R. The mnemonic '80's: Keywords in the classroom. Educational Psychologist, 1981, 16 (2), 65-82.
- Lewis, R.J. Can Learning Teams Improve Instruction? Educational Resources Information Center, 1979 (ED179512).
- McMann, F., Jr. In defense of lecture. The Social Studies, Nov/Dec 1979, 70(6), 270-74.
- McKeachie, W. Teaching Tips: A Guidebook for the Beginning College Teacher. Lexington, MA: D.C. Heath and Company, 1967.
- Megarry, J. Developments in simulation and gaming. International Yearbook of Educational and Instructional Technology, 1978-79.
- Melaragno, R.J. Intergrade tutoring on a school-wide basis. Improving Human Performance, 1972, 1, 22-26.
- Melaragno, R.J. Tutoring with Students: A Handbook for Establishing Tutorial Programs in Schools. Englewood Cliffs, NJ: Educational Technology Publications, 1976.
- Merrill, M.D. Component Display Theory. In C.M. Reigeluth (ed.), Instructional Design Theories and Models: An Overview of Their Current Status. Hillsdale, NJ: Erlbaum Assoc., 1983.
- Merrill, M.D. What Is Learner Control? A Final Report on an NSF grant, 1979.
- Merrill, P.F., and Bennion, J.L. Videodisc technology in education: The current scene. NSPI Journal, November 1979, 18-26.
- Military Training Management, Department of Army Field Manual FM21-5. Headquarters, Department of the Army, December 1964.
- Nolan, J.D. Are Lectures Necessary? Improving College and University Teaching, Fall 1974, 24 (4).
- Ortony, A. Why metaphors are necessary and not just nice. Educational Theory, 1975, 25, 45-54.
- Pope, L. Tutor: A Handbook for Tutorial Programs. Brooklyn, NY.

Preliminary Report of IETCSS Analysis, Volume I. Department Contract No. DABT 60-81-0017 (CDRL 012), RCA Service Corporation, Cherry Hill, New Jersey, November 1981.

Reigeluth, C.M. In search of a better way to organize instruction: The elaboration theory. Journal of Instructional Development, 1979, 2(3), 8-15.

Reigeluth, C.M. TICCIT to the Future: Advances in instructional theory for CAI. Journal of Computer-Based Instruction, November 1979, 6 (2), 40-46.

Reigeluth, C.M. (ed.) Instructional Design Theories and Models: An Overview of Their Current Status. Hillsdale, NJ: Erlbaum Assoc., 1983.

Reigeluth, C.M., and Merrill, M.D. Classes of instructional variables. Educational Technology, March, 1979, 5-24.

Reigeluth, C.M., and Stein, F.S. The elaboration theory of instruction. In C.M. Reigeluth (ed.), Instructional Design Theories and Models: An Overview of Their Current Status. Hillsdale, NJ: Erlbaum Assoc., 1983.

Reiser, R.A., and Gerlach, V.S. Research on simulation games in education: A critical analysis. Educational Technology, Dec. 1977.

Rosenbaum, P.S. Peer-Mediated Instruction. New York: Columbia University Teachers College Press, 1973.

Rothkopf, E.Z. A macroscopic model of instruction and purposive learning: An overview. Instructional Science, July 1981, 10 (2), 105-122.

Scandura, J. Instructional strategies based on the structural learning theory. C.M. Reigeluth (ed.), Instructional Design Theories and Models: An Overview of Their Current Status. Hillsdale, NJ: Erlbaum Assoc., 1983.

Shoemaker, B.R., and Parks, D.L. (eds.) An Instructional System Design for Vocational Education, 1976.

Simulations and Games: An ERIC Bibliography. In Bibliographies on Educational Topics, No. 11. Syracuse, NY: ERIC.

Slavin, R.E. Cooperative Learning. Review of Educational Research, 1980, 50 (2), 315-342.

Strain, P.S. (ed.) The Utilization of Classroom Peers as Behavior Change Agents. New York: Plenum Press, 1981.

Thiagarajan, S. Programmed Instruction for Literacy Workers. In H.S. Bhola (ed.), Literacy in Development: A Series of Training Monographs. Tehran, Iran: Hutton Educational Publications Ltd. in cooperation with the International Institute for Adult Literacy Methods, 1976.

Thiagarajan, S. Interactive individualization: An intermediate instructional technology. Educational Technology, 1977, 17, 39-44.

- Thiagarajan, S. Tutoraids. Vol. 20 of The Instructional Design Library. Englewood Cliffs, New Jersey: Educational Technology Publications, 1978.
- Thiagarajan, S., Summel, D.S., and Summel, M.I. Instructional Development for Training Teachers of Exceptional Children: A Sourcebook. Bloomington, IN: Indiana University, 1974.
- Thompson, R. Legitimate Lecturing. Improving College and University Teaching, Summer 1974, 22 (3), 163-4.
- Tutoring Resource Handbook for Teachers. Washington, DC: U.S. Department of Health, Education, and Welfare, 1974. (HEW Publication no. (OE) 74-00103.)
- Tutor Trainers' Resource Handbook. Washington, DC: U.S. Department of Health, Education, and Welfare, 1974. (HEW Publication no. (OE) 74-00102.)
- Twelker, P.A., and Layden, K. Educational Stimulation/Gaming: An ERIC Paper. Corvallis, OR: United States International University, 1972.
- Verduin, J.R., Miller, H.G., and Greer, C.E. Adults Teaching Adults: Principles and Strategies. Austin, TX: Learning Concepts, 1977.
- Voth, R. On Lecturing. The Social Studies, Nov. 1975, 66, 247-8.
- Wagner, H., and others. Team Training and Evaluation Strategies: A State-of-Art Review. Alexandria, VA: Human Resources Research Organization (HumRRO), 1976 (ED127958).
- Weaver, R.L. Effective lecturing techniques: Alternatives to classroom boredom. The Teacher Educator, summer, 1980, 16 (1).
- Weingarten, K., Hungerland, J., Brennan, M., and Allred, B. The APSTRAT Instructional Model. Alexandria, VA: Human Resources Research Organization.

**PHASE I
ANALYZE**

**PHASE II
DESIGN**

**PHASE III
DEVELOP**

**PHASE IV
IMPLEMENT**

**PHASE V
CONTROL**

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